Clear Lake

Site Description

Location
Water designation number (WDN)	32-0005-00
Legal description	T115N-R53W-Sec.11, 14, 15, 16, 22
County (ies)	Hamlin
Location from nearest town	1 mile east of Thomas, SD

Survey Dates and Sampling Information
Survey dates	July 1-2, 2014 (GN)
Gill net sets (n)	6

Morphometry
Watershed area (acres)	23,306
Surface area (acres)	≈750
Maximum depth (ft)	≈13
Mean depth (ft)	unknown

Ownership and Public Access
Clear Lake is a meandered lake owned by the State of South Dakota and the fish community is managed by SDGFP. A public access site which includes a boat ramp and landing dock on the north shore of Clear Lake is leased by SDGFP (Figure 1). Lands adjacent to Clear Lake are under private ownership.

Watershed and Land Use
The 23,306 acre Clear Lake sub-watershed (HUC-12) is located within the larger Big Sioux River (HUC-10) watershed. Land use within the watershed is primarily agricultural with a mix of pasture or grassland, cropland, and small shelterbelts.

Water Level Observations
Clear Lake has no established Ordinary High Water Mark and an outlet elevation was not available. On May 13, 2014 the elevation of Clear Lake was 1705.5 fmsl and above the summer 2013 elevation of 1704.7 fmsl. By October 15, 2014 water levels had declined to 1705.0 fmsl.

Fish Management Information
Primary species	smallmouth bass, walleye, yellow perch,
Other species	black bullhead, black crappie, common carp, northern pike, white crappie, white sucker
Lake-specific regulations	none
Management classification	warm-water marginal
Fish Consumption Advisories	none

Figure 1. Map depicting geographic location of several lakes in the Watertown, South Dakota area including Clear Lake (top). Also noted is the access site located on the north shore of Clear Lake (bottom). CHH= Clear Lake

Management Objectives

1) Establish a smallmouth bass population.

2) Maintain a mean gill net CPUE of stock-length walleye ≥ 10, a PSD of 30-60, and a PSD-P of 5-10.

3) Maintain a mean gill net CPUE of stock-length yellow perch ≥ 30, a PSD of 30-60, and a PSD-P of 5-10.

Results and Discussion

Clear Lake is a shallow-natural lake located within the Big Sioux River drainage near the town of Thomas in Hamlin County, South Dakota. Fish community surveys conducted in the 1960-70's indicated that Clear Lake was susceptible to winterkill and the fish community was often dominated by black bullhead, northern pike, and yellow perch.

Above normal precipitation during the mid to late 1990's resulted in an increase in the water depth of Clear Lake which lessened the probability of winterkill. In 1997, walleye were introduced into Clear Lake and subsequently a popular sport fishery developed. However, during the winter of 2008-09 Clear Lake suffered a substantial winterkill limiting walleye and yellow perch populations. Gill nets set just after ice-out during 2009 captured only low numbers of yellow perch. Since the 2008-09 winterkill Clear Lake has been stocked to re-establish the fish community (Table 6). Currently, Clear Lake is managed as a walleye and yellow perch fishery.

Primary Species

Walleye: In 2014, walleye relative abundance was again high with a mean gill net CPUE of 25.7 (Table 1). The 2014 mean gill net CPUE was above the minimum objective (≥ 10 stock-length walleye/net night; Table 3).

Walleye captured in the 2014 gill net catch ranged in TL from 24 to 49 cm (8.3 to 22.2 in; Figure 2). Otoliths collected from a sub-sample of gill net captured walleye suggested that some recent stocking efforts were successful as year classes produced in 2009 and 2011, which coincided with fry stockings, comprised 100% of walleye in the 2014 gill net catch (Table 4; Table 6; Figure 2). No individuals from the previously strong 2010 and newly stocked 2013 year classes were sampled (Table 4). The majority of walleye from the 2011 year class, which dominated the sample, were < quality-length; as a result, PSD and PSD-P values were low (Table 1; Table 3; Figure 2). As more walleye from the large 2011 year class, which ranged in TL from 28 to 37 cm (11.0 to 14.4 in) at the time of sampling, attain quality-length PSD values are expected to increase substantially (Table 4; Figure 2).

The 2011 walleye year class in Clear Lake has exhibited much slower growth than previous year classes with a weighted mean TL at capture of 322 mm (12.7 in) at age 3 (Table 5). Mean Wr values of walleye captured in the 2014 gill net catch were much lower than all previous samples with the mean Wr of stock-length walleye being 80 (Table 1). No length-related trends in walleye condition were apparent.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch in 2014 was 20.7 (Table 1) and below the minimum objective ($\geq$ 30 stock-length yellow perch/net night; Table 3). The 2014 gill net CPUE was higher than the 4.5 observed in 2011 (Table 2) and indicated moderate relative abundance.

In 2014, gill nets captured yellow perch that ranged in TL from 19 to 30 cm (7.5 to 11.8 in; Figure 3). Based on otolith age estimates, two year classes (2010 and 2011) comprised the entire sample with the most (94%) being from 2011(Table 7).

Yellow perch growth appeared to be fast with a weighted mean TL at capture of 242 mm (9.5 in) at age 3 (Table 8). Sampled stock-length yellow perch had a mean Wr of 100 (Table 1). No length-related trends in condition were apparent.

Other Species

Other: Black bullhead, common carp, northern pike, black crappie, and white sucker were other fish species captured in low numbers during the 2014 survey (Table 1).

Management Recommendations

1) Conduct fish community assessment surveys utilizing experimental gill nets every third year (next survey scheduled in summer 2017) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Collect otoliths from walleye and yellow perch to assess the age structure and growth rates of each population.

3) Stock walleye (≈500 fry/acre) on a biennial basis (odd years) to establish additional year classes.

4) Monitor winter and summerkill events. In cases of substantial winter/summerkill stock with walleye and yellow perch to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) of stock-length fish, for various fish species captured using experimental gill nets from Clear Lake, 2014. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= black bullhead; BLC= black crappie; COC= common carp; NOP = northern pike; WAE = walleye; WHC= white crappie; WHS = white sucker; YEP = yellow perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Gill nets								
BLB	4.3	1.0	100	0	65	16	93	1
BLC	0.2	0.2	100	---	100	---	95	---
COC	4.2	1.4	100	0	32	16	99	2
NOP	0.3	0.3	100	0	100	0	81	0
WAE	25.7	5.9	3	2	3	2	80	0
WHS	1.2	0.7	100	0	100	0	103	7
YEP	20.7	6.5	98	2	35	7	100	0

Table 2. Historic mean catch rate (CPUE; frame/gill nets= catch/net night) of stock-length fish for various fish species captured by experimental gill nets from Clear Lake, 2004-2014. BLB = black bullhead; COC= common carp; NOP = northern pike; WAE = walleye; WHC= white crappie; WHS = white sucker; YEP = yellow perch

Species	CPUE						
	2004	2005	2006[1]	2007[1]	2008	2011	2014
Gill nets							
BLB	0.3	0.0	0.0	0.0	0.0	0.0	4.3
BLC	0.0	0.0	0.0	0.0	0.0	0.0	0.2
COC	1.0	2.3	0.0	2.7	1.0	0.5	4.2
NOP	0.3	0.0	0.3	0.0	0.2	0.3	0.3
WAE	25.8	17.3	14.0	16.3	14.8	76.7	25.7
WHC	0.0	0.0	0.0	0.0	0.3	0.2	0.0
WHS	2.0	1.0	1.0	1.0	0.0	0.5	1.2
YEP	58.8	13.0	28.7	18.3	5.2	4.5	20.7

[1] Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured in frame nets and experimental gill nets from Clear Lake, 2004-2014. WAE = walleye; YEP = yellow perch

Species	2004	2005	2006[1]	2007[1]	2008	2011	2014	Objective
Gill nets								
WAE								
CPUE	26	17	14	16	15	77	26	≥ 10
PSD	55	67	36	96	100	21	3	30-60
PSD-P	1	4	5	4	20	0	3	5 – 10
Wr	95	86	90	96	95	108	80	---
YEP								
CPUE	59	13	29	18	5	5	21	≥ 30
PSD	69	56	83	27	29	44	98	30-60
PSD-P	33	0	7	22	23	19	35	5-10
Wr	107	110	115	110	102	103	100	---

[1] Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 4. Year class distribution based on the expanded age/length summary for walleye sampled in gill nets and associated stocking history (Number stocked x 1,000) from Clear Lake, 2006-2014.

| Survey Year | Year Class | | | | | | | | | | | | |
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
2014				150		5							
2011	---	---	---		72	389	1	2					
2008[2]	---	---	---	---	---	---		12	10	5	35	6	14
2007[1,2]	---	---	---	---	---	---	---		2	2	37	1	3
2006[1,2]	---	---	---	---	---	---	---	---			27	4	5
# stocked													
fry		300		300	600	300		600			1000		
small fingerling													
large fingerling													

[1] Monofilament gill net mesh size change (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")
[2] Older walleye were sampled but are not reported in this table

Table 5. Weighted mean length at capture (mm) for walleye age-1 through age-9 captured in experimental gill nets (expanded sample size) from Clear Lake, 2006-2014. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

| Year | Age | | | | | | | | |
	1	2	3	4	5	6	7	8	9
2014	---	---	322(150)	---	544(5)	---	---	---	---
2011	263(72)	370(389)	463(1)	485(2)	---	---	---	---	---
2008	163(12)	394(10)	444(5)	463(35)	521(6)	501(14)	505(14)	528(5)	---
2007	288(2)	395(2)	426(37)	441(1)	492(3)	498(3)	472(1)	---	---
2006	---	325(27)	413(4)	447(5)	473(5)	---	---	---	646(1)

Table 6. Stocking history including size and number for fishes stocked into Clear Lake, 2002-2014.

Year	Species	Size	Number
2004	WAE	fry	1,000,000
2007	WAE	fry	600,000
2009	WAE	fry	300,000
2010	BLC	fingerling	29,920
	BLC	adult	66
	WAE	fry	600,000
2011	WAE	fry	300,000
2012	SMB	fingerling	34,970
2013	WAE	fry	300,000

Table 7. Year class distribution based on the expanded age/length summary for yellow perch sampled in gill nets from Clear Lake, 2011-2014.

	Year Class							
Survey Year	2014	2013	2012	2011	2010	2009	2008	2007
2014				117	7			
2011	---	---	---		18	8		4

Table 8. Weighted mean total length (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Clear Lake, 2011-2014.

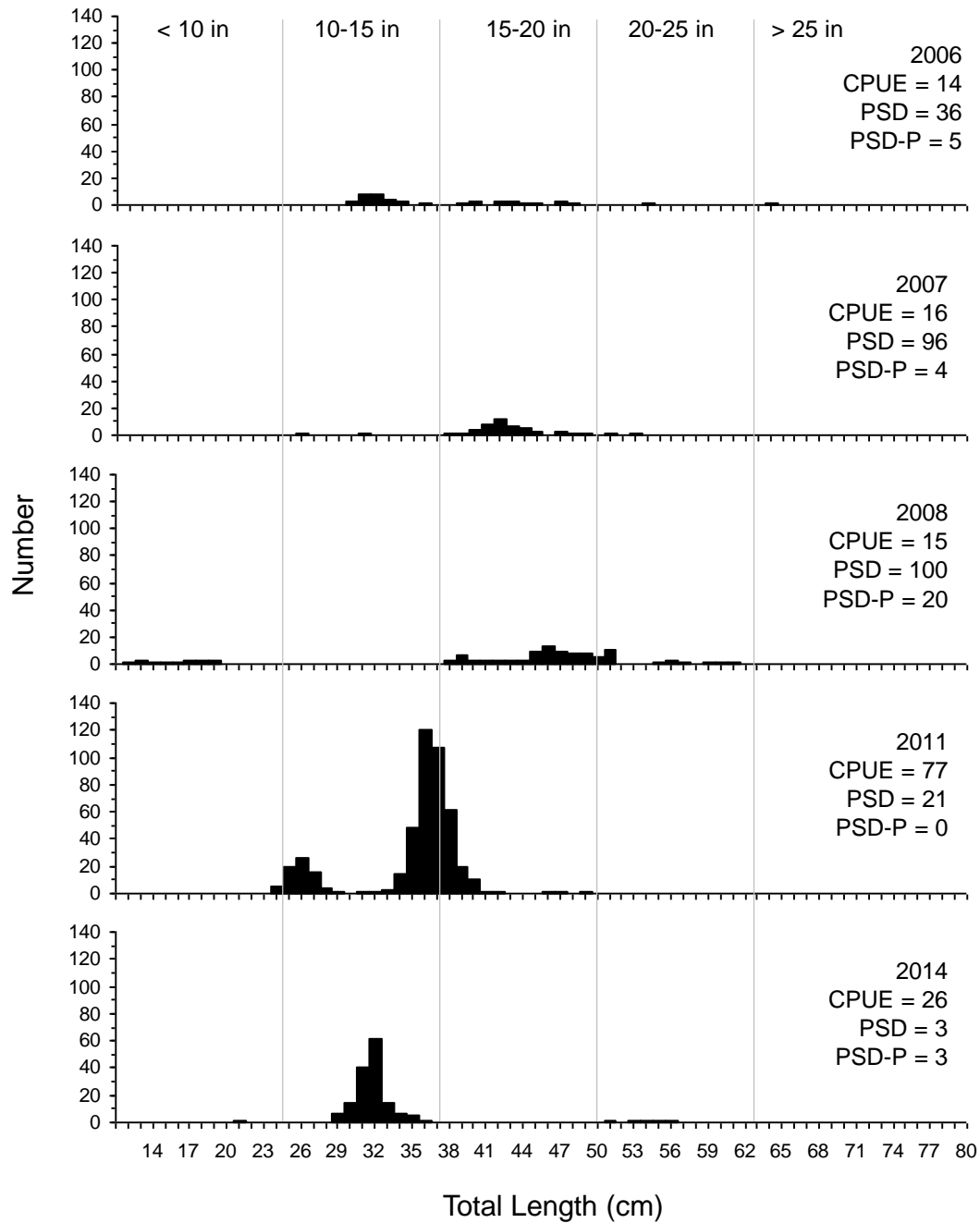|	Age			
Year	1	2	3	4
2014				
Male	---	---	220(14)	264(1)
Female	---	---	244(99)	293(5)
Combined	---	---	242(117)	284(7)
2011				
Male	143(5)	238(1)	---	256(1)
Female	140(13)	242(7)	---	307(3)
Combined	140(18)	242(8)	---	295(4)

Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Clear, 2006-2014.
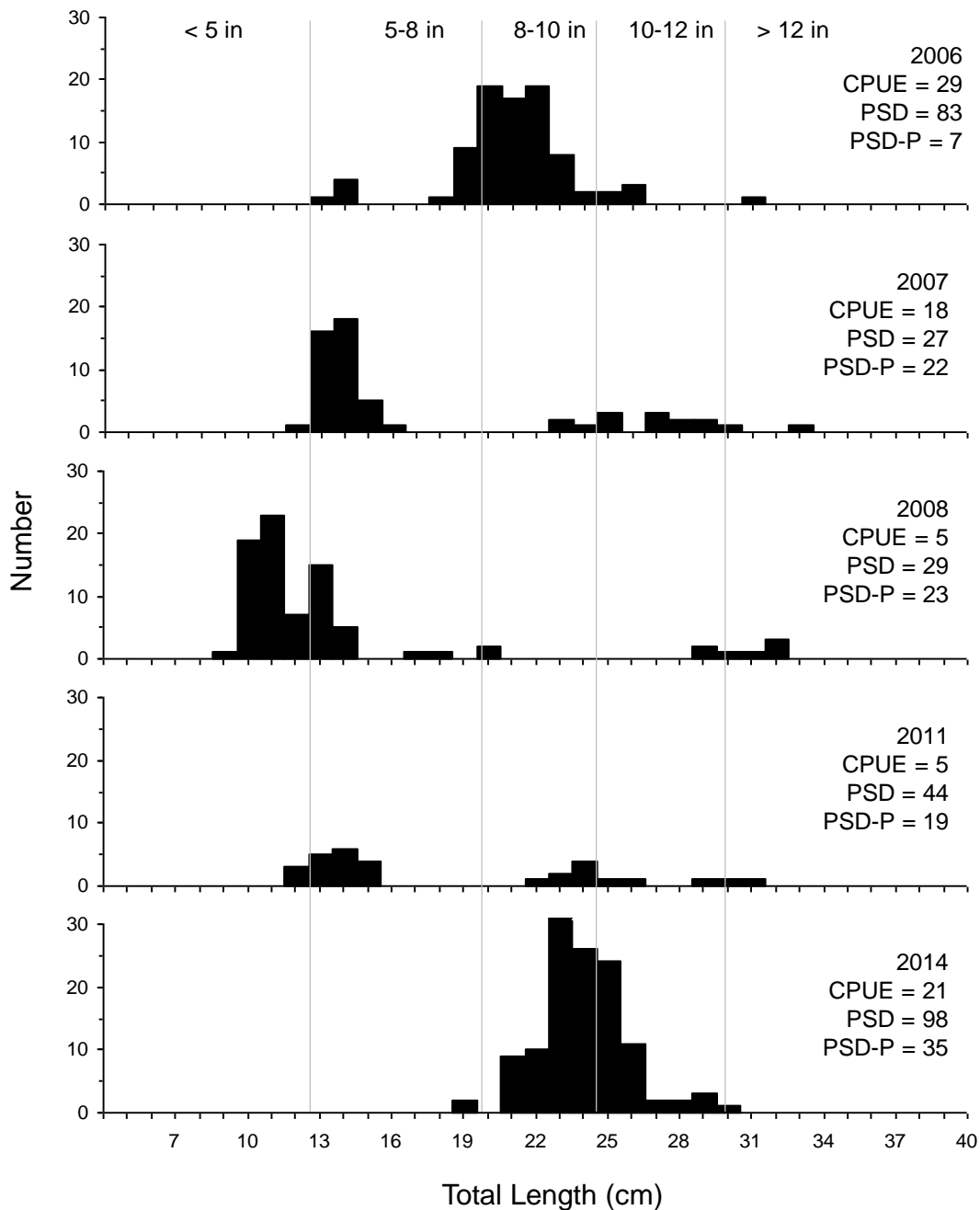
Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Clear Lake, 2006-2014.